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The Goldilocks mastectomy☆

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ABSTRACT

Objective: To reconstruct a breast mound from cutaneous mastectomy flap tissue alone, obviating the need for additional flap or implant techniques.
Summary background data: With growing numbers of obese and elderly women facing breast cancer, options outside of simple mastectomy without reconstruction and formal breast reconstruction using complex autologous flap harvesting techniques or artificial implants need to be explored.
Methods: Patients who declined traditional methods of breast reconstruction were offered standard skin sparing mastectomy with closure utilizing a standard Wise pattern. A completely autologous breast mound was created by preserving and de-epithelializing residual mastectomy flap tissue.
Results: Over 24 months, 32 women (50 breasts) underwent mastectomy and closure using this technique. Seromas occurred in 1of 50 operated breasts and cellulitis developed in 3 of 50 breasts. One of the two patients had active hidradenitis at the time of surgery which made expander placement a contraindication and post operative infection a high risk. There has been no incidence of locoregional breast cancer recurrence.
Conclusions: Some patients are poor candidates for traditional methods of breast reconstruction secondary to medical comorbidities, while others may decline for more personal reasons. For these patients, we describe an additional option. The procedure is performed in a single stage and does not necessitate closure by a reconstructive surgeon, although a team approach can improve aesthetic results. Disadvantages include limited applicability in patients with small, non-ptotic breasts. Deemed the "Goldilocks Mastectomy", it is neither amputation of the breast, nor is it full reconstruction. It is a third, middle option. This offers an aesthetic advantage for women over simple mastectomy without reconstruction and potentially decreases cost and number of procedures sometimes associated with formal reconstruction.

1. Introduction

Since the adoption of skin sparing mastectomy as an oncologically sound option for women with breast cancer,[1–6] numerous approaches and patterns for reconstruction have become popularized. Several subsets of patients present certain challenges to the reconstructive surgeon. Obese patients undergoing reconstruction with autologous flaps are at increased risk for fat necrosis, superficial skin loss, and delayed wound healing.[7,8] Older patients are more likely to decline complicated reconstructive procedures.[9] Patients with significant medical comorbidities may have frank contraindications to prolonged operative times.[10] These factors may exist singularly or in combination in patients facing breast cancer. For them, simple mastectomy without reconstruction has been the most viable option until our introduction of the Goldilocks mastectomy.

The storybook character "Goldilocks" was presented with a variety of choices. She did not want anything that was "too hot" or "too cold". She did not want anything that was "too hard" or "too soft". Ultimately, she chose the option that was a compromise of both attributes. For our purposes, the term 'Goldilocks' represents a satisfying option while avoiding extremes. We have navigated a middle road between formal reconstruction after mastectomy and the amputated appearance associated with mastectomy without reconstruction.

☆ This submission details a novel means of breast reconstruction for women with macromastia or extreme ptosis. It combines the two time-honored breast surgery techniques of Wise pattern breast reshaping and skin sparing mastectomy.
Not all patients want or need full reconstruction after mastectomy, yet almost none would choose results furnished by mastectomy without reconstruction. Utilizing only residual tissue following skin sparing mastectomy, there can be another option that leaves fullness without the time, cost, or expense associated with implant-based or autologous tissue reconstruction.

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2. Methods

2.1. Patient selection

Patients who were candidates for skin sparing mastectomy technique were given this additional option after declining formal reconstruction and committing to simple mastectomy without reconstruction. These patients had little to no expectations with regard to final breast volume and instead were primarily focused on simplifying the treatment and follow-up process with regard to breast health.

From July 2010 to May 2012 Goldilocks mastectomies were performed on 32 women (50 breasts). Eighteen patients chose bilateral Goldilocks mastectomies and fourteen chose unilateral procedures.

Patients choosing unilateral procedures were counseled that they would have severe asymmetry and a contralateral procedure to improve overall symmetry was offered. Ten patients underwent simultaneous contralateral reduction for symmetry, one underwent delayed reduction for symmetry, and one had history of a previous unilateral mastectomy of the contralateral breast.

One woman chose bilateral Goldilocks mastectomies for prophylaxis, while the remaining women had breast cancer diagnoses. The average age of these patients was 61.5 years old (range of 41–94 years, median of 56). The average BMI of these patients was 30.3 (range of 18–51.9, median of 30). Post-mastectomy radiation was recommended in 5 of the 32 patients and 2 of the 32 patients had preoperative radiation exposure. Of those with prior history of radiation, one was related to lung cancer treatment and the other was secondary to a previous history of breast cancer treated with lumpectomy and radiation.

2.2. Surgical technique

The patient is marked preoperatively in a standing position. (Fig. 1) The breast meridian and inframammary folds are marked on both sides. The apex of the reduction pattern is marked along the breast meridian as it projects anteriorly from the level of the inframammary fold (IMF). This measures between 22 and 25 cm, depending on the patient's breast size and shape. The vertical limbs are drawn at an 80 degree angle, 8 cm in length. The medial horizontal line is drawn and connected to a point marked about 3 cm medial to midline and the lateral horizontal line is drawn and connected to a point where the inframammary fold crosses the anterior axillary line.

A skin sparing mastectomy is performed through either a circumareolar incision or an ellipse, depending on the breast configuration. All grossly visible breast parenchyma is removed while maintaining adequate perfusion to the skin flaps. Fig. 2a shows intraoperative image of skin sparing mastectomy. When necessary, sentinel lymph node biopsy and/or axillary dissection is carried out through the same incisions. Sharp dissection is then used to de-epithelialize the lower pole fasciocutaneous flaps inside the boundaries of the Wise pattern incision. The upper and lower poles are then sharply divided from one another. Fig. 2b shows the de-epithelialized lower pole flap divided from the Wise pattern. The lower pole tissue is rested on the chest wall in a semblance of a mound. In cases of large lower pole flaps, the tissue is molded to produce central fullness simulating a breast mound. Two-0 vicryl sutures are placed superiorly and medially through the molded flap to maintain the position. The remaining skin envelope is closed using the standard Wise-pattern with the most inferior portion of the upper pole sutured to the limit of de-epithelialized dermis of the lower pole (Fig. 2). The median point to which the inverted T-junction is affixed is more medially oriented and tends to be 10–12 cm from the patient's midline. This prevents an excess of lateral tissue and capitalizes on reorienting the residual mastectomy flap tissue medially and superiorly to produce medial cleavage. Fig. 2d shows intraoperative result, and Fig. 3a and b shows the same 94 year old patient preoperatively and 8 weeks afterwards.

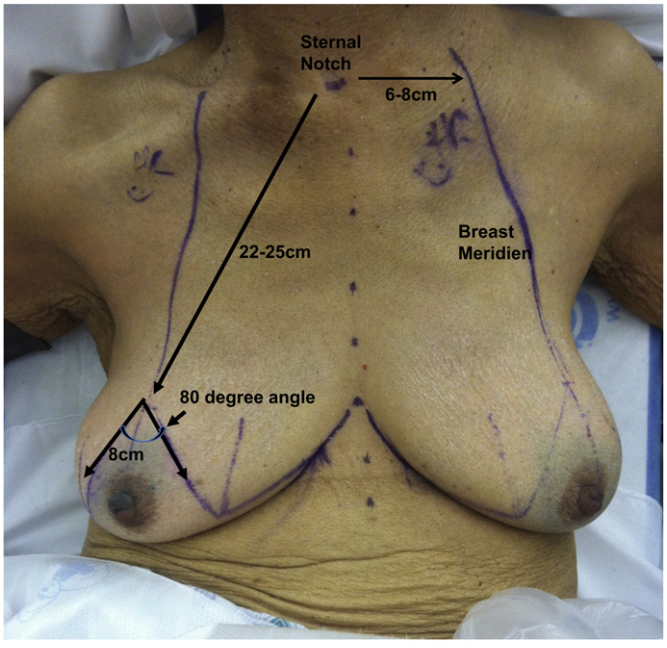

Fig. 1. Wise pattern markings are made preoperatively with the patient in standing position.

Length of the de-epithelialized flap varied from patient to patient, extending from the IMF to the inferior areolar margin. While typical rectangular fasciocutaneous flaps require a width to height ratio of 2:1 to maintain adequate perfusion to the distal flap, our technique utilizes a trapezoidal shape which takes advantage of the natural graduated thickness of adipose tissue as it extends from the IMF to the areola. If vascularity of the distal flap appears compromised, it is excised. Additionally, the medial and lateral extent of the superior horizontal limbs is not incised all the way to the IMF incision, thereby preserving the subdermal plexus from the surrounding skin. Taking care to leave the patient with well perfused flaps has thus far proven successful as only one patient has had any clinical evidence of fat necrosis.

3. Results

After all options were offered to patients, a total of 32 women (50 breasts) elected to proceed with the Goldilocks technique. Mastectomy was performed as treatment for neoplastic disease as well as for prophylaxis. Fourteen patients chose a unilateral mastectomy and the remaining eighteen chose bilateral mastectomies. Those who underwent contralateral mastectomy for prophylaxis did so by personal choice. They had been properly counseled about the option of contralateral reduction mammoplasty for symmetry. Five of 14 patients choosing a unilateral procedure declined a simultaneous contralateral reduction; one went on to have a contralateral reduction for symmetry in a delayed fashion. Length of follow-up ranges between two and 22 months. No patients required any additional surgical procedures related to complications from the original surgery. Patients report high levels of satisfaction with their results and an IRB study comparing patient satisfaction with the Goldilocks mastectomy versus formal reconstruction is currently underway.

Prolonged seroma formation was noted in one of 50 breasts. This required JP drainage for 3–5 days beyond that usually necessary in simple mastectomies. This patient required JP drains for a total of 3 weeks and additionally had two percutaneous seroma drainage procedures. Patients with areas of induration in the early post-operative period were followed by serial physical exams and in all but one case, these areas softened over time. In one case, a persistent discrete mass was noted along the vertical incision. This was biopsied 15 months post-procedure, with pathology revealing a sebaceous cyst, chronic inflammation and fat necrosis. No patients had any evidence of local disease recurrence, although one patient was appreciated to have distant disease during a post-operative staging work up which occurred 2 weeks following her surgery.

Cellulitis developed in 6% (3 of 50 breasts). One patient had active hidradenitis at the time of surgery and went on to develop cellulitis of both breasts. The cellulitis resolved in one patient after a 2-week course of antibiotics, while the other patient required 4 weeks.

Figs. 4 and 5 illustrate preoperative and postoperative results for bilateral and unilateral procedures.

4. Discussion

The US Census statistics project that the number of individuals over 65 will double from 20 to 40 million by 2040,[11] and

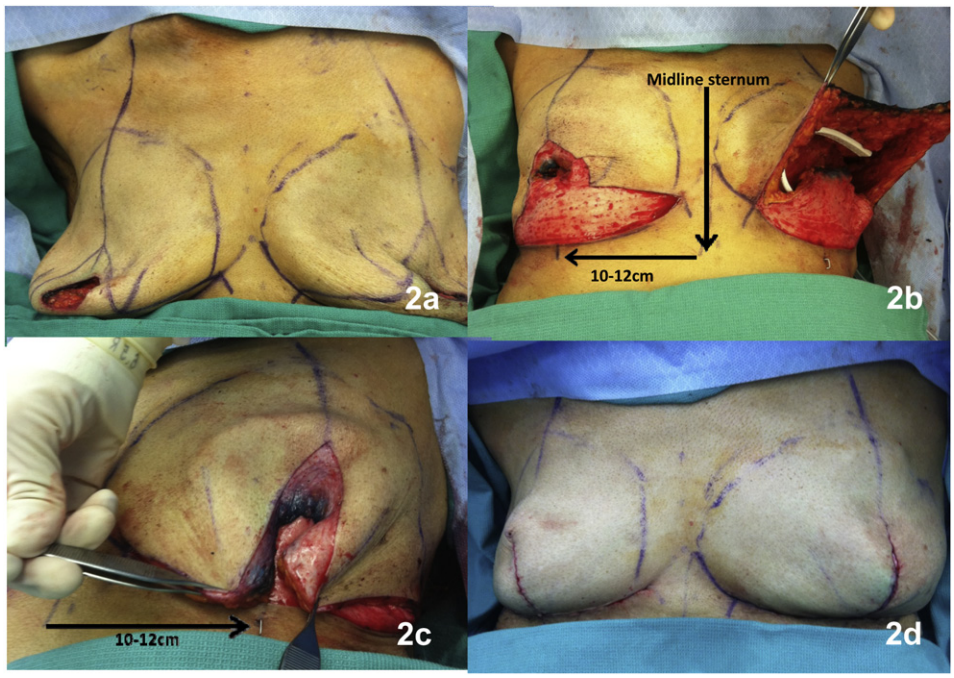

Fig. 2. (a) Skin sparing mastectomy has been performed through a periareolar incision; the patient is upright. (b) The inferior portion of the patients' right breast has been de-epithelized within the lower Wise pattern marking, and the left breast undergone division of the horizontal limbs, freeing the lower pole which now makes up the flap. A drain has been placed as well. (c) The skin envelope is closed in the standard inverted T fashion with the midpoint of the breast mound typically positioned 10–12 cm laterally from the sternum. (d) Final on table result.

presumably the detection of breast cancer will also rise in this population. Additional options to address oncologic safety and efficient use of resources will be necessary.[12]

The preservation of de-epithelialized tissue is not a novel concept. It has been utilized for dual plane coverage over an implant[13] as well as an adjunct in preventing superficial necrosis, specifically at the T-junction, in patients undergoing a Wise pattern incision for mastectomy.[14] Our technique utilizes this same de-epithelialized inferior pole tissue as a local autologous dermal-cutaneous flap for reconstruction of a breast mound after mastectomy.

The main benefit of using local tissue for reconstruction is to avoid the potential long term complications associated with implants. Many patients do not harbor enough local tissue to provide adequate bulk with which to form a breast mound. The patient with extremely large or ptotic breasts is in a unique position to allow preservation of fatty subcutaneous tissue that would otherwise be discarded with the breast specimen in a simple mastectomy. Because mastectomy flaps with a minimum thickness of 5mm preserve the natural plane of subcutaneous tissue containing perforating vessels while simultaneously allowing for adequate excision of breast parenchyma, patients with a redundant skin envelope harbor enough remaining viable soft tissue to allow rearrangement into a breast mound.[15,16]

There have been several modifications of the Wise pattern aimed at reducing superficial necrosis and preventing wound separation. Derderian described preservation of de-epithialized tissue beyond the skin incision.[14] and Losken et al. recently described preservation of the inferior pole with the aim of providing dual plane coverage over an implant.[13] Our technique

Fig. 3. Ninety-four year old patient. BMI 18.0 with left DCIS treated with bilateral Goldilocks mastectomies preoperatively and at 8 weeks postoperatively. Only mastectomy flap tissue is present. There are no implanted prosthetics present, and no additional flap tissue was raised outside of the mastectomy site.

Fig. 4. (a and b) Forty-four years old patient: BMI 29.5, bilateral mastectomy for prophylaxis secondary to gene positive family history. (c and d) Seventy-five years old patient: BMI 33.3, right mastectomy for DCIS, left prophylactic mastectomy. (e and f) Seventy years old patient: BMI 36.1, right mastectomy for DCIS, left mastectomy for invasive mixed ductal and lobular carcinoma. (g and h) Fifty-eight years old patient: BMI 51.9 initially treated for left IDC with lumpectomy and mammosite, DCIS of right breast noted; underwent bilateral mastectomies; history of kidney transplant on immunosupression.

was developed independently, but in research we did find a brief mention in the 1970 edition of The Atlas of Gynecological Surgery regarding the technical feasibility of utilizing inferior pole tissue as a local flap for reconstruction after mastectomy.[17]

For those patients declining traditional methods of breast reconstruction our method of "minimal reconstruction" provides several advantages. It can be performed by a single surgeon as a single staged procedure. It requires no prosthetic implanted material and therefore saves the patient potential complications associated with foreign body including infection, exposure or erosion. It is theoretically cost effective and no additional recuperation is needed as no distal donor sites are required. For those patients requiring an external prosthesis, the breast mound serves as a shelf to anchor the brassiere and prevent it from riding up on the chest wall.

In addition, patients with standard mastectomy incisions without formal reconstruction often have redundant areas of fullness on the lateral or medial portion of the incision site. The reapproximation of dermal edges in the Wise pattern naturally pulls the lateral thoracic fold tissue centrally to contribute to the projection of the recreated breast mound and at the same time reduces bulk in the axillary fold region, avoiding the formation of dog ears.

Patients who choose this procedure typically do not want a fully reconstructed appearance or are in a subset of patients who have contraindications to complex reconstruction. While most patients are completely satisfied with the final appearance, those who wish to have more volume to the mastectomy sites and have no medical contraindications, have several options. These may include fat grafting and injections, breast augmentation using implants, and

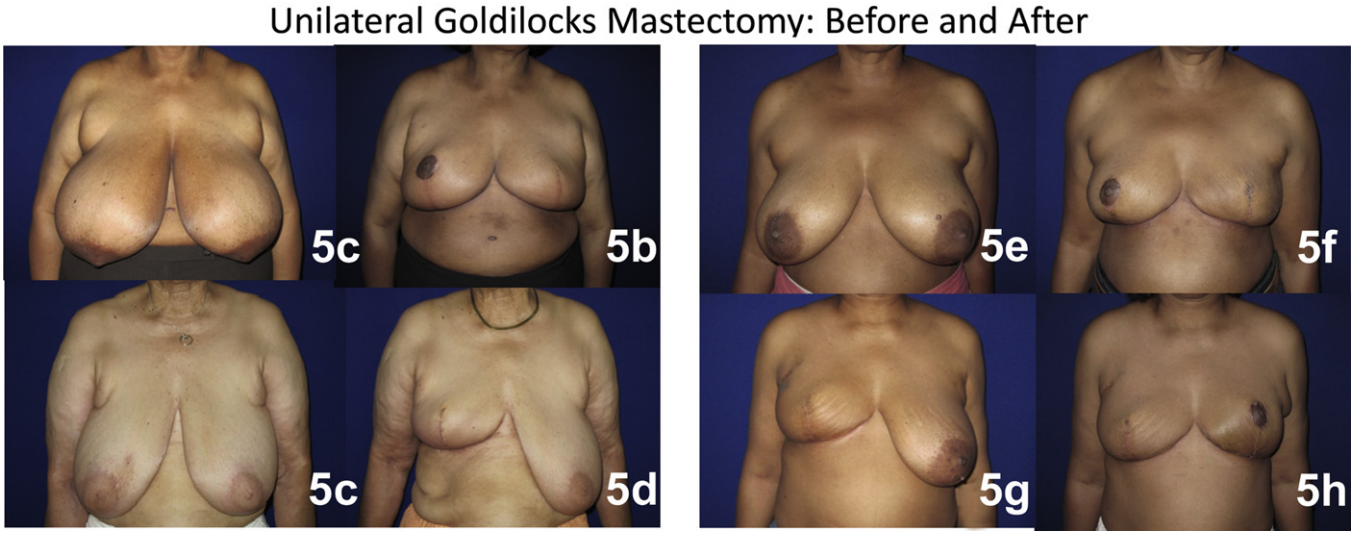

Fig. 5. (a and b) Fifty-nine years old patient: BMI 34, left mastectomy for multifocal IDC with DCIS, right reduction mammaplasty. (c and d) Seventy-four years old patient: BMI 31.1, right mastectomy for DCIS. (e and f) Sixty-seven years old patient: BMI 25.5, left mastectomy for IDC with DCIS, right reduction mammaplasty for symmetry. (g and h) Fifty-six years old patient: BMI 30.6, s/p neoadjuvant chemo; right mastectomy for IDC with delayed left reduction mammaplasty for symmetry.

any other standard breast reconstruction method. In our experience, one patient has chosen to undergo bilateral nipple – areolar micropigmentation and one patient who initially expressed the desire for possible augmentation mammoplasty after her procedure. However, after completing the healing process, and is satisfied with her Goldilocks mastectomy procedure alone. Four patients have purchased prosthetic silicone nipples to wear under their clothing.

The primary disadvantage of this procedure is the limited window of applicability. It is truly only suited for patients with large or significantly ptotic breasts who decline formal reconstruction. While this may be a relatively small percentage of patients considering mastectomy, the power of the prevalence of breast cancer in general makes this quite a large number of potential candidates. Additionally, the ultimate appearance is consistent with an extreme breast reduction. Patients should be appropriately counseled about the anticipated aesthetic result prior to undergoing this procedure.

5. Conclusion

For the subset of breast cancer patients with large or ptotic breasts who have chosen mastectomy without reconstruction, we feel there are advantages to having an additional choice in the Goldilocks mastectomy. Simplification of the terminology has made the subject of mastectomy options more approachable for these patients.

Ethical approval

The information enclosed has been gathered under the governance of Piedmont Hospital IRB committee in accordance with Protocol #PHI11-002, “Satisfaction with Goldilocks Mastectomy Closure in Patients with Macromastia: The Goldilocks Study”.

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Author contribution

Heather Richardson, MD – Technical contribution, data collection, editing and writing.

Grace Ma, MD – Technical contribution, data collection, and editing.

Conflicts of interest

None declared.

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